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# Nitrates in Animals

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# Introduction

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- **Definition:** Nitrate poisoning occurs when animals consume high levels of nitrate.
- Nitrates are naturally found in many plants and soils and become harmful under certain conditions.
- The condition is more common in ruminants (like cattle and sheep) but can affect pets as well.
- **Importance:** Can cause severe illness or death, impacting farm productivity and pet health.

# Sources of Nitrates

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- **Plants:** Corn, sorghum, millet, beet tops, pigweed, and certain weeds tend to accumulate nitrates.
- **Fertilizers:** Excessive use of nitrogen fertilizers increases nitrate levels in plants and soil.
- **Water:** Contaminated wells or surface water can contain harmful nitrate concentrations.
- Environmental stressors such as drought, cloudy weather, or frost can increase nitrate accumulation in plants.

# Animals Affected

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## Farm Animals:

- Ruminants (cattle, sheep, goats) are most susceptible.
- Horses and pigs are less commonly affected but can still suffer poisoning.



## Pets:

- Dogs and cats may ingest nitrate-contaminated water or plants, though cases are rare.
- Poisoning may occur if pets consume garden plants or contaminated water sources.

# Why do they get sick?

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High levels of nitrate impact the ability of blood to carry oxygen.

**Result:** hypoxia (lack of oxygen) at the tissue level, causing respiratory distress and organ damage.

Severity depends on the dose and rate of nitrate ingestion.

# Clinical Signs in Farm Animals

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- Early signs: rapid and labored breathing, restlessness, muscle tremors.
- Weakness, staggering gait, and collapse as oxygen deprivation worsens.
- Mucous membranes appear bluish or brownish (cyanosis) due to methemoglobin.
- In severe cases, animals may die suddenly without other signs.



# Clinical Signs in Pets

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- Symptoms usually appear within hours after ingestion.
- Vomiting and diarrhea due to gastrointestinal irritation.
- Weakness, lethargy, and difficulty breathing.
- Cyanosis (blue gums or tongue) indicates lack of oxygen.
- Severe cases may lead to seizures, coma, or death if untreated.



# Nitrates can be toxic to dogs, but toxicity depends on the amount ingested and the source.

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## Toxic dose:

Toxicity thresholds vary. In general, nitrate toxicity can occur in dogs at doses around **200-500 milligrams per kilogram (mg/kg) of nitrate.**



# Common Sources

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Fertilizer ingestion



Contaminated water or well water with high nitrate levels



Certain plants like spinach, lettuce, beets, and some weeds can accumulate nitrates

# Diagnosis

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- **History:** Look for access to nitrate-rich feed, plants, or contaminated water.
- **Clinical examination:** Observe for cyanosis, breathing difficulty, and neurological signs.
- **Laboratory tests:** Blood methemoglobin levels are elevated (>15% is significant).
- Testing feed and water nitrate content helps confirm the source of poisoning.

# Treatment

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- Immediate removal of suspected nitrate sources to prevent further absorption.
- **Methylene blue** is the antidote; it helps convert methemoglobin back to hemoglobin.
- Supportive care includes oxygen therapy and intravenous fluids to support organ function.
- In severe cases, activated charcoal or rumen lavage may be used in farm animals.
- Early intervention improves survival chances significantly.

# Prevention

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1. Regularly test forage, water, and soil nitrate levels, especially during drought or after fertilization.
2. Avoid feeding plants known to accumulate nitrates or test them before feeding.
3. Provide animals with sufficient water and good nutrition to reduce nitrate uptake.
4. Rotate pastures and avoid grazing animals on fields recently fertilized or stressed by drought.
5. Educate farm workers and pet owners about the risks and early signs.

# Summary

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- Nitrate poisoning is a serious toxic condition primarily in ruminants but can affect pets.
- Caused by ingestion of high nitrate levels found in certain plants and contaminated water.
- Leads to methemoglobinemia, impairing oxygen transport and causing hypoxia.
- Recognizing clinical signs and early treatment with methylene blue are crucial.
- Prevention through management of feed and water sources is the best approach.



# References / Further Reading

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- Veterinary Toxicology textbooks (e.g., “Veterinary Toxicology” by Gupta)
- Extension service fact sheets from agricultural universities
- Recent research articles on nitrate toxicity in animals
- Animal health websites (e.g., Merck Veterinary Manual)



# Thank you

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